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(54) **SUBSTRATE MOUNTING TABLE AND SUBSTRATE PROCESSING APPARATUS**

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H01L 21/683 (2006.01)
H01L 21/67 (2006.01)

(52) **U.S. Cl.**
CPC ***H01L 21/6833*** (2013.01); ***H01L 21/67126*** (2013.01); ***H01L 21/6831*** (2013.01)

(58) **Field of Classification Search**
USPC 361/234, 230
See application file for complete search history.

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(57) **ABSTRACT**

A substrate processing apparatus includes a processing chamber and a substrate mounting table. The processing chamber defines a processing space. The substrate mounting table includes a base and an electrostatic chuck, and is disposed in the processing space. The base has a coolant path formed therein. The electrostatic chuck is provided on the upper surface of the base through an adhesive layer formed by curing a liquid adhesive, and has an electrode therein. Here, a first adhesive region is provided on the upper surface of the base, and is adhered to the electrostatic chuck through the adhesive layer. The first adhesive region has a center portion recessed compared with the end portion of the first adhesive region.

16 Claims, 3 Drawing Sheets

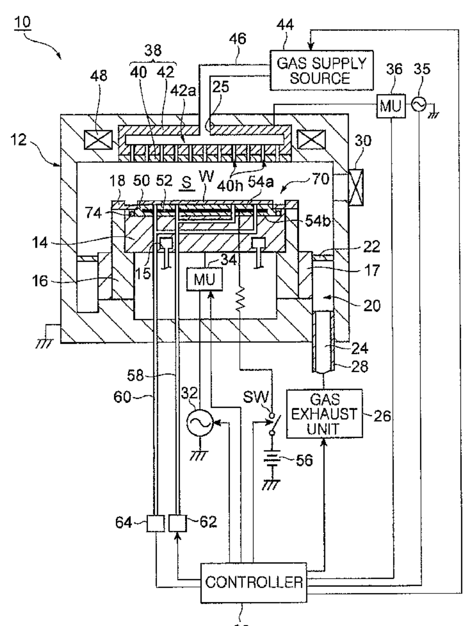
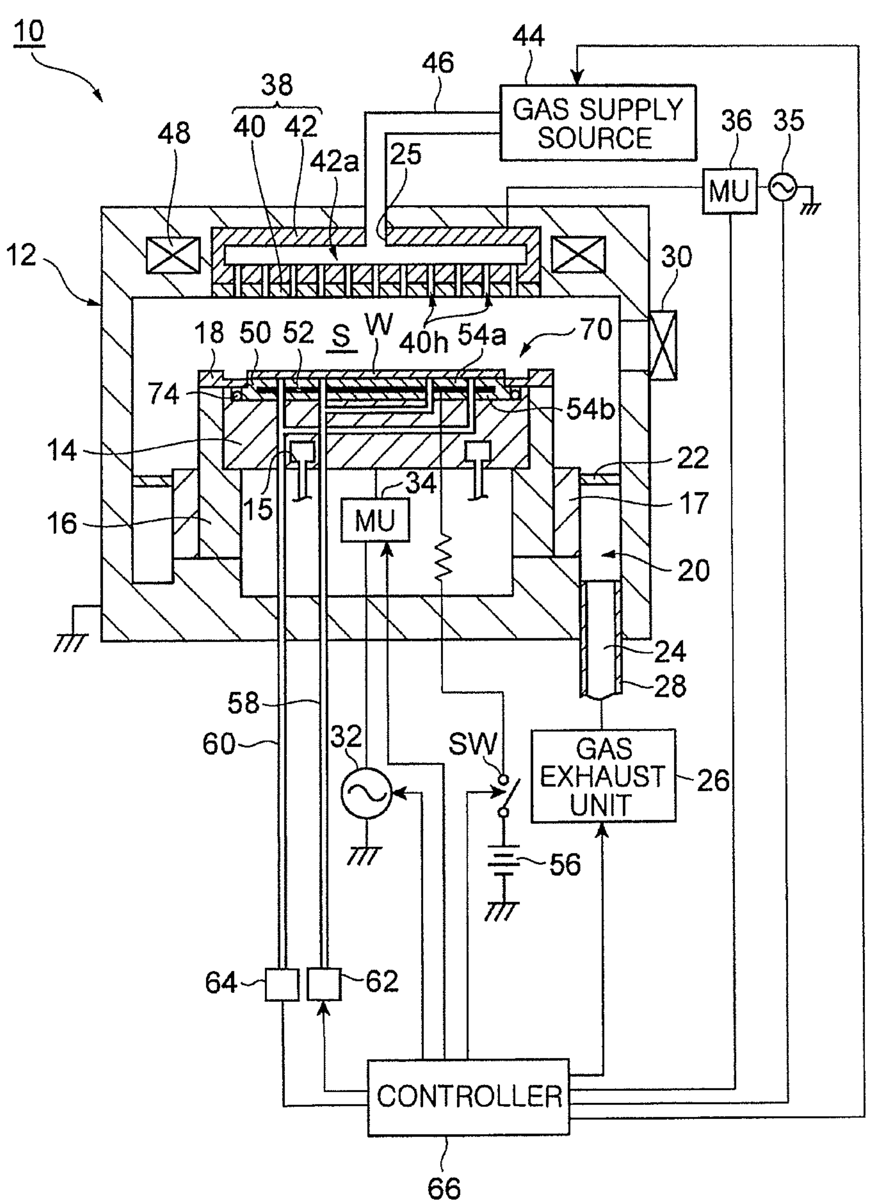


FIG. 1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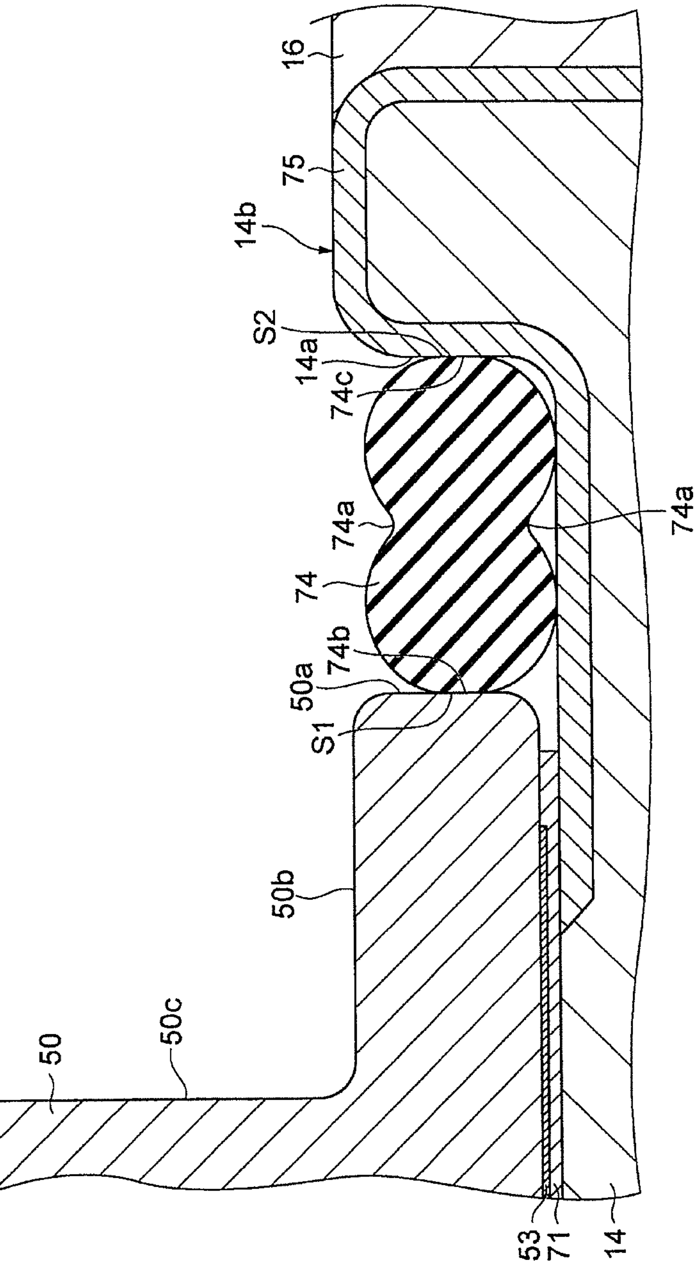


FIG. 2

FIG. 3A

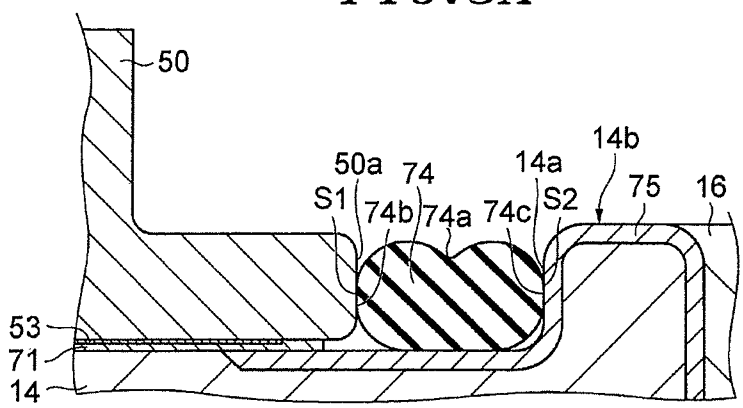


FIG. 3B

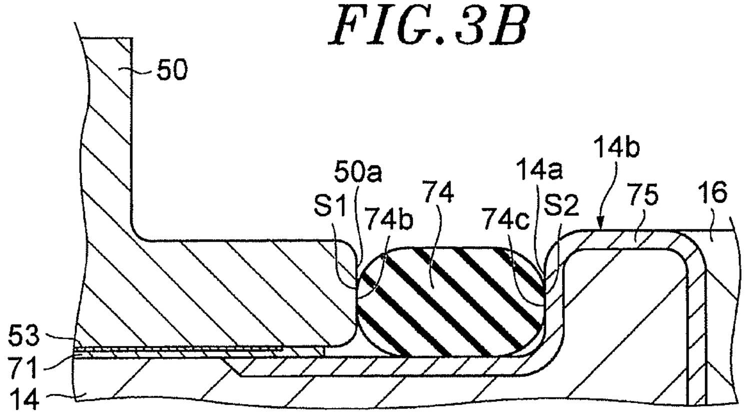
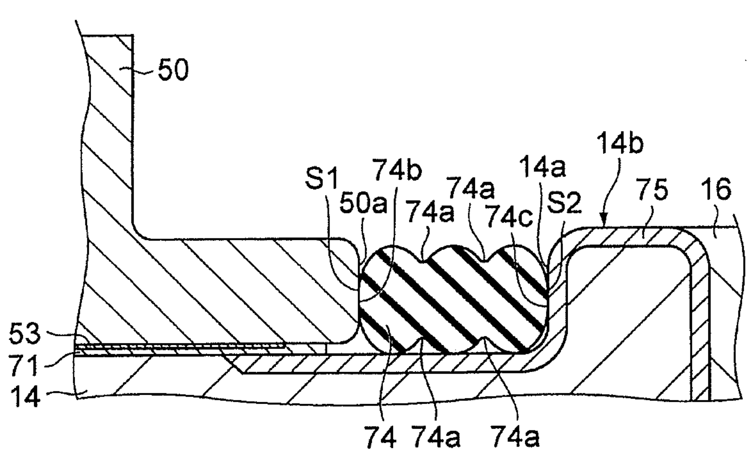


FIG. 3C



SUBSTRATE MOUNTING TABLE AND SUBSTRATE PROCESSING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to Japanese Patent Application No. 2012-133080 filed on Jun. 12, 2012 and U.S. Provisional Application No. 61/663,106 filed on Jun. 22, 2012, the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

Various aspects and embodiments of the present invention relate to a substrate mounting table and a substrate processing apparatus.

BACKGROUND OF THE INVENTION

Conventionally, there has been known a substrate mounting table including an electrostatic chuck having therein an electrode for electrostatic adsorption and a base for adjusting the temperature of the electrostatic chuck (see, e.g., Japanese Patent Application Publication No. 2005-33181). In the substrate mounting table disclosed in the above-cited reference, the electrostatic chuck and the base are adhesively integrated with each other through an adhesive layer. The upper surface of the base has a substantially mesa shape, and the electrostatic chuck is disposed on the upper surface (mounting surface) of the mesa plateau. The upper surface of the electrostatic chuck has a larger surface area than the mounting surface. As a result, the electrostatic chuck is disposed in a state where its edge protrudes radially outwardly beyond the mounting surface. Around the side surface of the adhesive layer, a flexible coating member with a resistance to plasma is provided. The coating member is tightly attached on the side surface of the electrostatic chuck, an end portion of the lower surface of the electrostatic chuck, and the upper surface (periphery) of the base other than the mesa plateau. As another example, the coating member is tightly attached on the side surface of the electrostatic chuck, the end portion of the lower surface of the electrostatic chuck, the upper surface of the base other than the mesa plateau, and the side surface of the mesa plateau of the base. Accordingly, the deterioration of the adhesive layer may be prevented because the side peripheral surface of the adhesive layer is protected by the coating member from active species and the like generated by a plasma.

However, when heat is applied to the substrate mounting table disclosed in the above-cited reference, the coating member may be subjected to a significant thermal expansion/contraction depending on the material of the coating member. In the case when the coating member is largely thermally expanded, the adhesive layer may be peeled off due to a force pushing up the end portion of the lower surface of the electrostatic chuck. Further, when the coating member is largely thermally contracted, a gap may be formed between the coating member and the end portion of the lower surface of the electrostatic chuck and the plasma or the like may enter the gap. Therefore, in the art, there have been required a substrate mounting table and a substrate processing apparatus capable of adequately protect the adhesive layer bonding the base and the electrostatic chuck together.

SUMMARY OF THE INVENTION

In accordance with an aspect of the present invention, there is provided a substrate processing apparatus including a processing chamber and a substrate mounting table. The processing chamber defines a processing space. The substrate mounting table includes a base, an electrostatic chuck and a sealing member. The base has a coolant path formed therein and an annular protruding portion formed to protrude upward along a circumferential direction on an edge portion of the upper surface of the base. The electrostatic chuck is provided on the upper surface of the base at an inner side of the protruding portion through an adhesive layer in a state where it is separated from the protruding portion, and has an electrode therein. The sealing member has an annular shape, and is disposed on the upper surface of the base between a side surface of the protruding portion and a side surface of the electrostatic chuck such that the sealing member makes close contact with the side surface of the protruding portion and the side surface of the electrostatic chuck.

In accordance with another aspect of the present invention, there is provided a substrate mounting table including a base, an electrostatic chuck and a sealing member. The base has a coolant path formed therein and an annular protruding portion formed to protrude upward along a circumferential direction on an edge portion of the upper surface of the base. The electrostatic chuck is provided on the upper surface of the base at an inner side of the protruding portion through an adhesive layer in a state where it is separated from the protruding portion, and has an electrode therein. The sealing member has an annular shape, and is disposed on the upper surface of the base between a side surface of the protruding portion and a side surface of the electrostatic chuck such that the sealing member makes close contact with the side surface of the protruding portion and the side surface of the electrostatic chuck.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram schematically showing a substrate processing apparatus in accordance with an embodiment of the present invention.

FIG. **2** is a partially enlarged cross-sectional view of the substrate mounting table in accordance with the embodiment of the present invention.

FIGS. **3**A to **3**C are schematic views for explaining modifications of the embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Hereinafter, various embodiments of the present invention will be described in detail with reference to the accompanying drawings. Throughout the drawings, like reference numerals will be given to like parts having substantially the same function and configuration.

FIG. **1** is a diagram schematically showing a substrate processing apparatus in accordance with an embodiment of the present invention. FIG. **1** shows a cross-section of the substrate processing apparatus in accordance with the embodiment of the present invention. The substrate processing apparatus **10** shown in FIG. **1** is a parallel plate type plasma processing apparatus.

The plasma processing apparatus **10** includes a processing chamber **12**. The processing chamber **12** has a substantially cylindrical shape and defines a processing space S therein. The plasma processing apparatus **10** includes a substantially disc-shaped base **14** in the processing chamber **12**. The base **14** is disposed at a lower portion of the processing space S. The base **14** is made of, e.g., aluminum, and constitutes a second electrode. The base **14** has a function of absorbing the heat of an electrostatic chuck **50** to cool the electrostatic chuck **50**, which will be later described.

A coolant path **15** for coolant is formed in the base **14**, and a coolant inlet line and a coolant outlet line are connected to the coolant path **15**. By circulating a suitable coolant, such as cooling water or the like, in the coolant path **15**, it is possible to control the temperature of the electrostatic chuck **50** and the base **14** to a predetermined temperature.

In the present embodiment, the plasma processing apparatus **10** further includes a cylindrical support **16** and a cylindrical supporting member **17**. The cylindrical support **16** is in contact with the edges of the side and bottom surfaces of the base **14** to support the base **14**. The cylindrical supporting member **17** vertically extends upward from the bottom of the processing chamber **12** to support the base **14** via the cylindrical support **16**. The plasma processing apparatus **10** further includes a focus ring **18** disposed on the upper surface of the cylindrical support **16**. The focus ring **18** is made of, for example, silicon, quartz, or the like.

In the present embodiment, an exhaust passage **20** is formed between the cylindrical supporting member **17** and a sidewall of the processing chamber **12**. A baffle plate **22** is attached to the inlet of the exhaust passage **20** or in the middle of the exhaust passage **20**. Further, an exhaust port **24** is provided at the bottom of the exhaust passage **20**. The exhaust port **24** is defined by an exhaust pipe **28** that is fitted to the bottom of the processing chamber **12**. The exhaust pipe **28** is connected to a gas exhaust unit **26**. The gas exhaust unit **26** has a vacuum pump and can depressurize the processing space S of the processing chamber **12** to a predetermined vacuum level. A gate valve **30** for opening and closing a loading/unloading port for a target object (substrate) W is provided at the sidewall of the processing chamber **12**.

A high frequency power supply **32** for plasma generation is electrically connected to the base **14** via a matching unit (MU) **34**. The high frequency power supply **32** applies a high frequency power of a predetermined high frequency (e.g., 27 MHz or above) to the second electrode, i.e., the base **14**.

The plasma processing apparatus **10** further includes a shower head **38** in the processing chamber **12**. The shower head **38** is provided at an upper portion of the processing space S. The shower head **38** includes an electrode plate **40** and an electrode holder **42**.

The electrode plate **40** is a substantially disc-shaped conductive plate and is fixed by screws or the like to the electrode holder **42**. The electrode plate **40** and the electrode holder **42** constitute a first electrode. A high frequency power supply **35** for plasma generation is electrically connected to the electrode holder **42** via a matching unit (MU) **36**. The high frequency power supply **35** applies a high frequency power of a predetermined high frequency (e.g., 27 MHz or above) to the electrode holder **42**. A high frequency electric field is generated in the processing space S between the base **14** and the electrode plate **40** when the high frequency power supplies **32** and **35** apply high frequency powers to the base **14** and the electrode plate **40**, respectively.

A plurality of gas vent holes **40***h* is formed in the electrode plate **40**. The electrode plate **40** is detachably held by the electrode holder **42**. A buffer space **42***a* is defined in the electrode holder **42**. The plasma processing apparatus **10** further includes a gas supply source **44** connected to a gas inlet port **25** of the buffer space **42***a* through a gas supply line **46**. The gas supply source **44** supplies a processing gas into the processing space S. For example, the gas supply source **44** can supply a CF-based etching gas. In the electrode holder **42**, a plurality of gas holes is formed to communicate with the respective gas vent holes **40***h* and the buffer space **42***a*. Thus, the gas from the gas supply source **44** is supplied to the processing space S through the buffer chamber **42***a* and the gas vent holes **40***h*.

In the present embodiment, a magnetic field generating mechanism **48** arranged annually or concentrically is provided in the ceiling portion of the processing chamber **12**. The magnetic field generating mechanism **48** serves to make easy the start of a high frequency power discharge (plasma ignition) in the processing space S and to maintain a stable discharge.

In the present embodiment, the electrostatic chuck **50** is disposed on the upper surface of the base **14**. The electrostatic chuck **50** is a member that is substantially disk-shaped. The electrostatic chuck **50** includes an electrode **52** and a pair of insulating films **54***a* and **54***b*. The insulating films **54***a* and **54***b* are formed of an insulating material, such as ceramic or the like. The electrode **52** is a conductive film disposed between the insulating films **54***a* and **54***b*. That is, the electrostatic chuck **50** includes the electrode **52** therein. A DC power supply **56** is connected to the electrode **52** via a switch SW. When a DC voltage is applied to the electrode **52** from the DC power supply **56**, a Coulomb force is generated, and the wafer W is attracted and held on the electrostatic chuck **50** by the Coulomb force. A heater **53** (see FIGS. **2** to **3**C), as a heating element, is disposed on the lower surface of the electrostatic chuck **50** to heat the wafer W to a predetermined temperature. The heater **53** is connected to a heater power supply (not shown) through wiring. The electrostatic chuck **50** and the base **14** constitute a mounting table **70**.

In the present embodiment, the plasma processing apparatus **10** further includes gas supply lines **58** and **60**, and heat transfer gas supply units **62** and **64**. The heat transfer gas supply unit **62** is connected to the gas supply line **58**. The gas supply line **58** extends to the upper surface of the electrostatic chuck **50** and also extends annularly in a central portion of the corresponding upper surface. The heat transfer gas supply unit **62** supplies a heat transfer gas, such as He gas, between the upper surface of the electrostatic chuck **50** and the wafer W. Further, the heat transfer gas supply unit **64** is connected to the gas supply line **60**. The gas supply line **60** extends to the upper surface of the electrostatic chuck **50** and also extends annularly to surround the gas supply line **58** in the corresponding upper surface. The heat transfer gas supply unit **64** supplies a heat transfer gas, such as He gas, between the upper surface of the electrostatic chuck **50** and the wafer W.

In the present embodiment, the plasma processing apparatus **10** further includes a controller **66**. The controller **66** is connected to the gas exhaust unit **26**, the switch SW, the high frequency power supplies **32** and **35**, the matching units **34** and **36**, the gas supply source **44**, and the heat transfer gas supply units **62** and **64**. The controller **66** sends individual control signals to the gas exhaust unit **26**, the switch SW, the high frequency power supplies **32** and **35**, the matching units **34** and **35**, the gas supply source **44**, and the heat transfer gas supply units **62** and **64**. The controller **66** sends control signals to the gas exhaust unit **26** to exhaust the gas, the switch SW to open and close, the high frequency power supplies **32** and **35** to supply power, the matching units **34** and **36** to control impedance, the gas supply source **44** to supply the processing gas, and the heat transfer gas supply units **62** and **64** to individually supply the heat transfer gas. Further, the controller **66**, connected to the heater power supply (not shown), controls the temperature of the wafer W by controlling the current supplied to the heater, which will be later described.

In the plasma processing apparatus **10**, the processing gas is supplied into the processing space S from the gas supply source **44**. Further, a high frequency electric field is formed between the electrode plate **40** and the base **14**, i.e., in the processing space S. Thus, plasma is generated in the processing space S and the wafer W is etched by, e.g., radicals (e.g., oxygen radicals) of the element contained in the processing gas.

The configuration of the mounting table **70** will now be described in detail. FIG. **2** is a partially enlarged cross-sectional view of the mounting table **70** shown in FIG. **1**. As shown in FIG. **2**, at the upper surface of the base **14**, the electrostatic chuck **50** is provided through an adhesive layer **71**. The adhesive layer **71** is formed by curing a liquid adhesive. As the liquid adhesive, for example, an organic adhesive including a silicon-based material, an acrylic-based or acrylate-based material, or a polyimide-silica-based material may be used.

At an edge portion of the upper surface of the base **14**, a protruding portion **14*b*** is formed to protrude upward (in a direction perpendicular to the radial direction). On the inner side of the protruding portion **14*b*** which is formed in an annular shape in a circumferential direction on the upper surface of the base **14**, the electrostatic chuck **50** is bonded through the adhesive layer **71** in a state where it is separated from the protruding portion **14*b***. Further, a protective layer **75** may be provided by spraying the surface of the base **14**.

The electrostatic chuck **50** is a disk-shaped member having a lower portion **50*b*** protruding radially outward. The thickness of the lower portion **50*b*** is thinner than or substantially the same as the protruding width (height) of the protruding portion **14*b***; and the focus ring **18** mounted on the upper surface of the protruding portion **14*b*** is disposed in the vicinity of an upper side surface **50*c*** of the electrostatic chuck **50**. A side surface **50*a*** of the lower portion **50*b*** and a side surface **14*a*** of the protruding portion **14*b*** are parallel with each other.

Between the side surface **14*a*** of the protruding portion **14*b*** and the side surface **50*a*** of the electrostatic chuck **50**, a sealing member **74** for protecting the adhesive layer **71** is disposed on the upper surface of the base **14**. The sealing member **74** is an annular member with a substantially elliptical cross-section. The thickness of the sealing member **74** in the perpendicular direction to the longitudinal direction of the elliptical cross-section is thinner than the protruding height of the protruding member **14*b***. The sealing member **74** is formed of a material having plasma resistance and elasticity, and, for example, a fluorine-based resin (e.g., perfluoroelastomer) is used as the material.

The sealing member **74** has a stress alleviation portion for alleviating the stress applied between the side surface **14*a*** of the protruding portion **14*b*** and the side surface **50*a*** of the electrostatic chuck **50**. As an example of the stress alleviation portion, a recess (neck portion) **74*a*** is formed in the center portion of the sealing member **74**. The center portion of the sealing member **74** is most expanded in the perpendicular direction to the longitudinal direction of the elliptical cross-section when force is applied to the sealing member **74** in the longitudinal direction of the elliptical cross-section. By forming the recess **74*a*** in the center portion, it is possible to suppress the expansion in the perpendicular direction to the longitudinal direction of the elliptical cross-section. The recess **74*a*** is formed in pair at opposite positions in the perpendicular direction to the longitudinal direction of the elliptical shape. Further, the depth of the recess **74*a*** is determined by a simulation or the like to optimally alleviate the stress applied to the electrostatic chuck **50**, the base **14**, and the sealing member **74**.

The sealing member **74** is press-fitted between the side surface **14*a*** of the protruding portion **14*b*** and the side surface **50*a*** of the electrostatic chuck **50** to make close contact with the side surfaces **14*a*** and **50*a***. Here, one end **74*c***, in the longitudinal direction of the elliptical cross-section, of the sealing member **74** is in close contact with the side surface **14*a*** of the protruding portion **14*b***; and the other end **74*b***, in the longitudinal direction of the elliptical cross-section, of the sealing member **74** is in close contact with the side surface **50*a*** of the electrostatic chuck **50**. In other words, the sealing member **74** is disposed such that a pushing force is exerted to the side surface **14*a*** of the protruding portion **14*b*** and the side surface **50*a*** of the electrostatic chuck **50**. As a result, a sealing surface **S1** is formed between the sealing member **74** and the side surface **50*a***, and a sealing surface **S2** is formed between the sealing member **74** and the side surface **14*a***. Further, the sealing member **74** having the elliptical cross-section is arranged as described above, as compared with a case of a circular cross-section, can reduce an upward expansion thereof while securing a large space between the protruding portion **14*b*** and the electrostatic chuck **50**.

In the present embodiment, the adhesive layer **71** is provided with the heater **53**. The heater **53** is disposed on the lower surface of the electrostatic chuck **50**. The heater **53**, for example, adheres to the lower surface of the electrostatic chuck **50** by an adhesive resin, such as epoxy.

As described above, in the substrate processing apparatus **10** in accordance with the present embodiment, the annular sealing member **74** is disposed between the protruding portion **14*b*** provided at the edge portion of the upper surface of the base **14** and the electrostatic chuck **50** to make close contact with the side surface **50*a*** of the electrostatic chuck and the side surface **14*a*** of the protruding portion **14*b***. In this way, by sealing the adhesive layer **71** in the horizontal direction, it is possible to protect the adhesive layer **71**. Further, even if the space between the protruding portion **14*b*** and the electrostatic chuck **50** is narrowed by heat, since the sealing member **74** is not in close contact in the upward direction, it is possible to avoid applying an upward force to the electrostatic chuck **50** and other members. Therefore, it is possible to adequately protect the adhesive layer **71** not to be peeled off. Further, even if the space between the protruding portion **14*b*** and the electrostatic chuck **50** is widened by heat, the sealing member **74**, which is in close contact with the side surface **50*a*** of the electrostatic chuck and the side surface **14*a*** of the protruding portion to apply a pushing force thereto in the horizontal direction, can maintain a sealed state by extending in the horizontal direction to follow the widen space between the electrostatic chuck **50** and the protruding portion **14*b***. Therefore, it is possible to properly protect the adhesive layer **71** without exposing the adhesive layer **71** to plasma or the like.

Further, in the substrate processing apparatus **10** in accordance with the present embodiment, the sealing member **74** has a substantially elliptical cross-section and the recess **74*a*** is depressed in the perpendicular direction to the longitudinal direction of the elliptical cross-section. Accordingly, even if a force is applied to the sealing member **74** in the longitudinal direction of the elliptical cross-section due to the narrowing space between the electrostatic chuck **50** and the protruding portion **14*b***, the stress can be alleviated at the recess **74*a*** to suppress the upward expansion of the sealing member **74**.

Furthermore, in the present embodiment, the sealing member is configured such that the thickness thereof in the perpendicular direction to the longitudinal direction of the elliptical cross-section is thinner than the protruding width of the protruding portion **14*b***. Accordingly, even if a force is applied to the sealing member **74** in the longitudinal direction of the elliptical cross-section due to the narrowing space between the electrostatic chuck **50** and the protruding portion **14***b*, it is difficult for the recess **74***a* to protrude upward beyond the protruding portion **14***b*.

The present invention is not limited to the above embodiment. FIGS. **3**A to **3**C are schematic views showing modifications of the above embodiment. In the above embodiment, two recesses **74***a* are formed opposite to each other; however, as shown in FIG. **3**A, the recess **74***a* may be formed only on the top side. Further, as shown in FIG. **3**B, the sealing member **74** may not include the recess **74***a*. Alternatively, as shown in FIG. **3**C, a plurality of the recesses **74***a* may be formed along the longitudinal direction of the elliptical cross-section.

The plasma processing apparatus has been described as an example of a substrate processing apparatus in the above embodiment, but the present invention is not limited thereto. A thermal CVD apparatus or another vapor deposition apparatus may be employed. Further, an etching apparatus, a film forming apparatus, and the like may also be employed. That is, any apparatus for processing a substrate may be employed without limiting the use or the configuration thereof.

In the above embodiment, the adhesive layer **71** has the heater **53**, but the heater **53** may not be provided. Further, the heater **53** may be provided in the electrostatic chuck **50**.

In the above embodiment, the adhesive layer **71** is formed of a single adhesive layer, but the adhesive layer **71** may be formed of multiple layers of multiple adhesives. Further, the base **14** and the electrostatic chuck **50** may be bonded together in combination with an adhesive sheet.

While the invention has been shown and described with respect to the embodiments, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the scope of the invention as defined in the following claims.

What is claimed is:

1. A substrate processing apparatus, comprising:

a processing chamber defining a processing space; and

a substrate mounting table disposed in the processing space,

wherein the substrate mounting table includes:

a base having a coolant path formed therein, and an annular protruding portion formed to protrude upward along a circumferential direction on an edge portion of an upper surface of the base;

an electrostatic chuck having an electrode therein, the electrostatic chuck provided on the upper surface of the base at an inner side of the protruding portion through an adhesive layer in a state where it is separated from the protruding portion; and

an annular sealing member disposed on the upper surface of the base between a side surface of the protruding portion and a side surface of the electrostatic chuck which are opposite to each other, the sealing member making close contact with the side surface of the protruding portion and the side surface of the electrostatic chuck,

wherein the sealing member has a substantially elliptical cross-section, and

wherein ends of the sealing member in a longitudinal direction of the elliptical cross-section make close contact with the side surface of the protruding portion and the side surface of the electrostatic chuck, respectively.

2. The substrate processing apparatus of claim **1**, wherein the side surface of the protruding portion and the side surface of the electrostatic chuck are parallel with each other.

3. The substrate processing apparatus of claim **1**, wherein the sealing member has a stress alleviation portion configured to alleviate a stress applied between the side surface of the protruding portion and the side surface of the electrostatic chuck.

4. The substrate processing apparatus of claim **2**, wherein the sealing member has a stress alleviation portion configured to alleviate a stress applied between the side surface of the protruding portion and the side surface of the electrostatic chuck.

5. The substrate processing apparatus of claim **3**, wherein the stress alleviation portion is a recess formed in a direction perpendicular to the longitudinal direction of the elliptical cross-section.

6. The substrate processing apparatus of claim **4**, wherein the stress alleviation portion is a recess formed in a direction perpendicular to the longitudinal direction of the elliptical cross-section.

7. The substrate processing apparatus of claim **3**, wherein the stress alleviation portion includes recesses oppositely formed in a direction perpendicular to the longitudinal direction of the elliptical cross-section.

8. The substrate processing apparatus of claim **4**, wherein the stress alleviation portion includes recesses oppositely formed in a direction perpendicular to the longitudinal direction of the elliptical cross-section.

9. The substrate processing apparatus of claim **3**, wherein the stress alleviation portion includes recesses formed at positions disposed in the longitudinal direction of the elliptical cross-section.

10. The substrate processing apparatus of claim **4**, wherein the stress alleviation portion includes recesses formed at positions disposed in the longitudinal direction of the elliptical cross-section.

11. The substrate processing apparatus of claim **1**, wherein the sealing member has a thickness in a direction perpendicular to the longitudinal direction of the elliptical cross-section thinner than a protruding width of the protruding portion.

12. The substrate processing apparatus of claim **2**, wherein the sealing member has a thickness in a direction perpendicular to the longitudinal direction of the elliptical cross-section thinner than a protruding width of the protruding portion.

13. The substrate processing apparatus of claim **3**, wherein the sealing member has a thickness in a direction perpendicular to the longitudinal direction of the elliptical cross-section thinner than a protruding width of the protruding portion.

14. The substrate processing apparatus of claim **4**, wherein the sealing member has a thickness in a direction perpendicular to the longitudinal direction of the elliptical cross-section thinner than a protruding width of the protruding portion.

15. The substrate processing apparatus of claim **5**, wherein the sealing member has a thickness in the direction perpendicular to the longitudinal direction of the elliptical cross-section thinner than a protruding width of the protruding portion.

16. A substrate mounting table comprising:

a base having a coolant path formed therein, and an annular protruding portion formed to protrude upward along a circumferential direction on an edge portion of the upper surface of the base;

an electrostatic chuck having an electrode therein, the electrostatic chuck provided on the upper surface of the base at an inner side of the protruding portion through an adhesive layer in a state where it is separated from the protruding portion; and

an annular sealing member disposed on the upper surface of the base between a side surface of the protruding portion and a side surface of the electrostatic chuck which are opposite to each other, the sealing member making close contact with the side surface of the protruding portion and the side surface of the electrostatic chuck,

wherein the sealing member has a substantially elliptical cross-section, and

wherein ends of the sealing member in a longitudinal direction of the elliptical cross-section make close contact with the side surface of the protruding portion and the side surface of the electrostatic chuck, respectively.

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